Access Servers

This chapter provides information on Cisco's access server products. The information is organized into the following sections:

- Product Overview
- Standard Features
- Interface Options
- Software Options
  - Cisco IOS Releases
  - LAT Terminal License
  - CiscoRemote Software
  - CiscoSecure UNIX Server
- Cisco 2500 Series Access Servers
- Cisco AS5100 Access Server
  - Hardware Details
  - Cisco AS5100 Access Server Network Management Products
  - Cisco AS5100 Access Server Product Numbers
  - Cisco AS5100 Access Server Bundled Systems
- Cisco AS5200 Universal Access Server
  - Cisco AS5200 Access Server Summary of Benefits
  - Cisco AS5200 Access Server Series Product Numbers
- Hardware Options

Note Documentation for the Cisco access servers is available in two forms: on a CD-ROM called Cisco Connection Documentation, Enterprise Series (formerly called UniverCD) and printed books. You can request a free copy of the documentation CD when you place an order and have the option of subscribing to a CD update service. Installation documentation ships with each chassis, and a configuration note ships with each component ordered. All configuration notes are available on the CD.

You can also access Cisco technical documentation on the World Wide Web URL http://www.cisco.com. For more information, see the chapter "Documentation."

Product Overview

Cisco access servers include the following products:

- Cisco 2500 series access servers

  The Cisco 2500 series access servers support 8 or 16 asynchronous ports, one Ethernet or Token Ring port, and two synchronous ports. The Cisco 2500 series access servers consist of the following models:

  — Model 2509 and 2509 DC

  — Model 2510

  — Model 2511 and 2511 DC

  — Model 2512

- Cisco AS5100 access server

  — 17 card slots

  — Up to 16 network application cards (NACs), which include the following:

  Access Server cards

  Quad modem cards

  Dual-channelized T1 card

  — All NACs support hot swapping, which allows you to insert and remove cards while the power is on

  — Two power supplies: one main supply and one redundant supply, which are accessible at the front of the chassis

  — AC or DC power supplies

- Cisco AS5200 universal access server

  — Modular chassis that contains three feature card slots and a high-speed, multilayer backplane

  — Up to three feature cards that provide either channelized T1, PRI, or modem support

  — One Ethernet LAN port

  — Two synchronous ports

  — AC or DC power supply

Standard Features

Table 159 compares the features of the Cisco access servers.

Table 159 Cisco Access Server Series Summary of Features

Characteristic	Cisco 2500 Series Access Servers	Cisco AS5100 Access Server	Cisco AS5200 Access Server
Supported network interfaces	Ethernet Synchronous serial Asynchronous serial Token Ring	Ethernet Synchronous serial Asynchronous serial	Ethernet Synchronous serial PRI/T1
Maximum asynchronous connections	8 or 16	48	48
Slots available for network interface cards	–	16	3
Choice of software feature sets	IP routing IP routing with IBM base functionality IP/IPX routing IP/IPX routing with IBM base functionality IP/IPX with IBM base functionality and APPN[1] Desktop Desktop with IBM base functionality Enterprise (includes IBM base functionality) Enterprise/APPN[1] Remote Access Server RMON[2]	IP routing IP routing with IBM base functionality IP/IPX routing IP/IPX routing with IBM base functionality Desktop Desktop with IBM base functionality Enterprise (includes IBM base functionality) Remote Access Server RMON[2]	IP routing IP/IPX routing Desktop Enterprise RMON[2]
Flash memory	All Cisco 2500 series access server models include a minimum of 4 MB of Flash memory; however, depending on the Cisco IOS release level shipped with the system, it might require more memory. Refer to Table 171, later in this chapter, for the minimum Flash memory required for each feature set.	All Cisco AS5100 access server models include a minimum of 4 MB of Flash memory; however, depending on the Cisco IOS release level shipped with the system, it might require more memory. Refer to Table 172, later in this chapter, for the minimum Flash memory required for each feature set.[3] Each access server card (AS51-16A-E) has one Flash SIMM socket; Cisco 2500 series access servers have two Flash SIMM sockets.	4-MB boot Flash 8-MB system Flash
Memory expandability	All models include the minimum DRAM required by the Cisco IOS release level shipped with the system. Refer to Table 171, later in this chapter, for the minimum DRAM required for each feature set.	All models include the minimum DRAM required by the Cisco IOS release level shipped with the system. Refer to Table 172, later in this chapter, for the minimum DRAM required for each feature set.[3]	All models include the minimum DRAM required by the Cisco IOS release level shipped with the system. Refer to Table 173, later in this chapter, for the minimum DRAM required for each feature set.

Characteristic	Cisco 2500 Series Access Servers	Cisco AS5100 Access Server	Cisco AS5200 Access Server
Dimensions (H x W x D)	1.75 x 17.5 x 10.56" (4.44 x 44.45 x 26.82 cm)	7 x 19 x 18.5" (17.78 x 48.26 x 47.21 cm)	3.5 x 17 x 15" (two rack units)
Weight (average shipping)	10 lb (4.5 kg)	54.5 lb (24.4 kg)	25 lb (11.4 kg)
Standard components	Power supply and cord Console cable RJ-45-to-DB-25 and RJ-4-to-DB-9 adapters Rack-mount /wall-mount kit	Power supply and cord Console cable RJ-45-to-DB-25 adapter Rack-mount /wall-mount kit	Power supply and cord Console cable 2 RJ-48 cables
Processor type	20-MHz 68030	20-MHz 68030	20-MHz 68030

1. This feature set is available with Cisco IOS Release 11.0 and later releases.
2. This feature set is available with Cisco IOS Release 11.1 and later releases.
3. There are three access server cards (AS51-16A-E) in each fully configured chassis. DRAM and Flash memory are required for each of the three access server cards.

Table 160 lists the environmental specifications for the Cisco access server series.

Table 160 Cisco Access Server Series Environmental Specifications

Description	Cisco 2500 Series Access Servers	Cisco AS5100 Access Server	Cisco AS5200 Access Server
Power	40W (135.5 Btu/hour)	Input: Maximum: 475W (1621 Btu/hour), 4A (AC) or 9.9A (DC) Typical[1]: 325W (1105 Btu/hour), 2.7A (AC) or 6.8A (DC) Output: 325W +5V, 45A –5V, 2A +12V, 3.5A –12V, 3.5A	180W
AC Input	110 to 220 VAC 50 to 60 Hz 1.0 to 0.5A	Strap selectable: 120V (90 to 132 VAC), 47 to 63 Hz or 240V (180 to 264 VAC), 47 to 63 Hz	100 to 240 VAC 50 to 60 Hz 1.5 to 3.0A
DC Input	–48 VDC (Cisco 2509-DC and Cisco 2511-DC only)	–48 VDC (–42 to –60 VDC)	–48 VDC (–48 to –60 VDC)
Operating temperature range	32 to 104 F (0 to 40 C)	32 to 104 F (0 to 40 C)	32 to 104 F (0 to 40 C)
Nonoperating temperature range	–40 to 185 F (–40 to 85 C)	–40 to 185 F (–40 to 85 C)	–40 to 185 F (–40 to 85 C)
Humidity (noncondensing)	5 to 95%	0 to 95%	5 to 95%

1. Configured with a T1 card, NMC, 3 AS51 cards, and 12 V.34 quad modem cards.

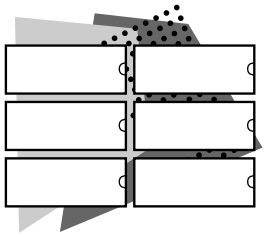
Interface Options

Table 161 lists the interfaces available for the Cisco access server series.

Table 161 Cisco Access Server Series Interfaces

Model	Ethernet	Token Ring	Serial	Asynchronous	PRI/T1
2509	1	0	2	8	0
2510	0	1	2	8	0
2511	1	0	2	16	0
2512	0	1	2	16	0
AS5100	3	0	3	48[1]	0
AS5201	1	0	2	0	2

1. You can choose between 48 individual basic telephone service connections or two channelized T1 connections.



Software Options

The Cisco access servers support the following Cisco IOS releases and other software options:

- Cisco IOS Release 11.1 feature sets: Table 162 and Table 163
- Cisco IOS Release 11.0 feature sets: Table 164
- Cisco IOS Release 10.3 feature sets: Table 165
- Cisco IOS Release 10.2 feature sets: Table 166
- LAT Terminal License
- CiscoRemote Software
- CiscoSecure UNIX Server

Note that all Cisco AS5100 access server cards (AS51-16A-E) must use the same Cisco IOS release level and feature set.

Note The Cisco AS5200 access server supports Cisco IOS Release 11.1 and later releases only.

Table 162 Cisco IOS Release 11.1 Feature Sets—Cisco Access Server Series

Category	IP Routing	IP/IPX Routing	Desktop	Enterprise	Remote Access Server[1]
LAN support	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE, Novell IPX	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE, Novell IPX, AppleTalk 1 and 2, DECnet IV	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE, Novell IPX, AppleTalk 1 and 2, DECnet IV, DECnet V, OSI, XNS, Banyan VINES, Apollo Domain	IP, multiring, GRE, Novell IPX, AppleTalk 1 and 2
WAN services	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56, IPXWAN 2.0	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56, IPXWAN 2.0	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56, IPXWAN 2.0	HDLC, PPP[3], X.25[4], Frame Relay, IPXWAN 2.0, Switched 56
WAN optimization	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing	Header[7], link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing	Header[7], link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing	Header[7], link and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing	Header[7], link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing
IP routing	RIP, RIP Version 2, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing	RIP, RIP Version 2, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing	RIP, RIP Version 2, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing	RIP, RIP Version 2, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing, ES-IS, IS-IS	RIP, RIP Version 2, IGRP, Enhanced IGRP, PIM, policy-based routing
Other routing	–	IPX RIP, NLSP	IPX RIP, NLSP, RTMP, AURP, SMRP	IPX RIP, NLSP, RTMP, AURP, SMRP, SRTP	IPX RIP, RTMP, AURP

Category	IP Routing	IP/IPX Routing	Desktop	Enterprise	Remote Access Server[1]
IBM support	Optional[8]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), NetView Native Service Point, QLLC, Bisync, BAN for SNA Frame Relay support	Optional[8]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), NetView Native Service Point, QLLC, Bisync, BAN for SNA Frame Relay support Optional[9]: APPN	Optional[8]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), NetView Native Service Point, QLLC, Bisync, BAN for SNA Frame Relay support	Included: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), NetView Native Service Point, QLLC, Bisync, BAN for SNA Frame Relay support, TG/COS, Downstream PU Concentration (DSPU) Optional[9]: APPN	–
Management	AutoInstall, SNMP, RMON events and alarms[10], Telnet, automatic modem configuration[11]	AutoInstall, SNMP, RMON events and alarms[10], Telnet, automatic modem configuration[11]	AutoInstall, SNMP, RMON events and alarms[10], Telnet, automatic modem configuration[11]	AutoInstall, SNMP, RMON events and alarms[10], Telnet, automatic modem configuration	AutoInstall, SNMP, RMON events and alarms[10], Telnet, automatic modem configuration
Security	Access lists, extended access lists, access security, TACACS+, RADIUS, MD5 routing authentication, Lock and Key	Access lists, extended access lists, access security, TACACS+, RADIUS, MD5 routing authentication, Lock and Key	Access lists, extended access lists, access security, TACACS+, RADIUS, MD5 routing authentication, Lock and Key	Access lists, extended access lists, access security, TACACS+, RADIUS, MD5 routing authentication, Lock and Key, Kerberized login	Access lists, extended access lists, access security, TACACS+, RADIUS, MD5 routing authentication, Lock and Key
Protocol translation	–	–	–	Telnet, LAT, rlogin, TN3270, X.25, PPP	Telnet, LAT, rlogin, TN3270, X.25, PPP

Category	IP Routing	IP/IPX Routing	Desktop	Enterprise	Remote Access Server[1]
Remote node[12]	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, NetBEUI over PPP	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, IPXCP[7], NASI[13], NetBEUI over PPP	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, ARAP 1.0/2.0, IPXCP[7], NASI[13], NetBEUI over PPP, MacIP, ATCP	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, IPX and ARAP on virtual async interfaces, ARAP 1.0/2.0, IPXCP[7], NASI[13], NetBEUI over PPP, MacIP, ATCP	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, IPX and ARAP on virtual async interfaces, ARAP 1.0/2.0, IPXCP[7], MacIP, ATCP
Terminal services[12]	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD, Xremote, LAT[14], TN3270	Telnet, rlogin, X.25 PAD, XRemote, LAT[14], TN3270
Product numbers	See Table 167.	See Table 167.	See Table 167.	See Table 167.	See Table 167.

1. The Remote Access Server feature set was first introduced in Cisco IOS Release 10.2(4).
2. See the category "IBM Support" for information about source-route bridging (SRB).
3. PPP includes support for LAN protocols supported by the feature set, address negotiation, PAP and CHAP authentication, and PPP compression. Multilink PPP is available in Cisco IOS Release 11.0(4) and later releases.
4. Includes X.25 switching.
5. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization features.
6. X.25 and Frame Relay payload compression.
7. IPX header compression (RFC 1553) is available in Cisco IOS Release 11.1(1) and later releases.
8. "Optional" means a separate Cisco IOS feature set with the IBM base option: IP/IBM base, IP/IPX/IBM base, Desktop/IBM base.
9. "Optional" means separate Cisco IOS feature sets: IP/IPX/IBM base/APPN and Enterprise/APPN.
10. The RMON events and alarms groups are supported on all interfaces. Enhanced RMON feature sets are also available. See Table 163.
11. Automatic modem configuration is available for all feature sets in Cisco IOS Release 11.1(2) and later releases. For the Enterprise feature set, automatic modem configuration is available in Cisco IOS Release 11.1(1) and later releases.
12. Supported on access servers (with limited support on router auxiliary ports).
13. NASI is supported in Cisco IOS Release 11.1(2) and later releases.
14. Use of LAT requires terminal license (FS-L8-10.X= for an 8-user license or FS-L16-10.X= for a 16-user license).

The Remote Monitoring (RMON) MIB (RFC 1757) allows you to monitor all nodes and their interaction on a LAN segment. Standard Cisco IOS Release 11.1 feature sets provide support for the RMON alarm and event groups only. If you prefer more network management support, you can order an enhanced RMON feature set that includes full support for the following nine groups: statistics, history, alarms, hosts, hostTopN, matrix, filter, capture, and events. Table 163 describes the contents of the enhanced IP/RMON, IP/IPX/RMON, and Enterprise/RMON feature sets.

Table 163 Cisco IOS Release 11.1 Feature Sets—RMON

Category	IP/RMON Routing[1]	IP/IPX/RMON Routing[1]	Enterprise/RMON[1]
LAN support	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE, Novell IPX	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE, Novell IPX, AppleTalk Phase1 and 2, DECnet IV, DECnet V, OSI, XNS, Banyan VINES, Apollo Domain
WAN services	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56, IPXWAN 2.0	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56, IPXWAN 2.0
WAN optimization	Header, link, and payload compression[6]; dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queueing, weighted fair queuing, snapshot routing	Header[7], link, and payload compression[6]; dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queueing, weighted fair queuing, snapshot routing	Header[7], link, and payload compression[6]; dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queueing, weighted fair queuing, snapshot routing
IP routing	RIP, RIP Version 2, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing	RIP, RIP Version 2, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing	RIP, RIP Version 2, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing, ES-IS, IS-IS
Other routing	–	IPX RIP, NLSP	IPX RIP, NLSP, RTMP, AURP, SMRP, SRTP
IBM support	Optional[8]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SLDC transport (STUN), Frame Relay SNA Support (RFC1490), NetView Native Service Point, QLLC, Bisync, BAN for SNA Frame Relay support	Optional[8]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SLDC transport (STUN), Frame Relay SNA Support (RFC1490), NetView Native Service Point, QLLC, Bisync, BAN for SNA Frame Relay support	Optional[8]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SLDC transport (STUN), Frame Relay SNA Support (RFC1490), NetView Native Service Point, QLLC, Bisync, BAN for SNA Frame Relay support, TG/COS, Downstream PU Concentration (DSPU)
Management	AutoInstall, SNMP, RMON: nine-group Ethernet[9], Telnet, automatic modem configuration	AutoInstall, SNMP, RMON: nine-group Ethernet[9], Telnet, automatic modem configuration	AutoInstall, SNMP, RMON: nine-group Ethernet[9], Telnet, automatic modem configuration
Security	Access lists, extended access lists, access security, TACACS+, RADIUS, MD5 routing authentication, Lock and Key	Access lists, extended access lists, access security, TACACS+, RADIUS, MD5 routing authentication, Lock and Key	Access lists, extended access lists, access security, TACACS+, RADIUS, MD5 routing authentication, Lock and Key, Kerberized login
Protocol translation	–	–	Telnet LAT, rlogin, TN3270, X.25, PPP

Category	IP/RMON Routing[1]	IP/IPX/RMON Routing[1]	Enterprise/RMON[1]
Remote node[10]	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, NetBEUI over PPP	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, IPXCP[7], NASI[11], NetBEUI over PPP	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, IPX on virtual asynch interfaces, IPXCP[7], NASI[11], NetBEUI over PPP, MacIP, ATCP
Terminal Services[10]	Telnet, rlogin, X.25, PAD	Telnet, rlogin, X.25, PAD	Telnet, rlogin, X.25, PAD, XRemote, LAT[12], TN3270

1. The IP/RMON, IP/IPX/RMON, and Enterprise/RMON feature sets are supported on the following Cisco 2500 series routers: 2501, 2503, 2505, 2507, 2509, 2511, 2513, 2514, 2516, 2518, 2520, and 2522. These features sets are also supported on AS5100 and AS5200 access servers.
2. See the category “IBM support” for information about SRB.
3. PPP includes support for the LAN protocols supported by the feature set, address negotiation, PAP and CHAP authentication, PPP compression, and Multilink PPP.
4. Includes X.25 switching.
5. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable “WAN optimization” features.
6. X.25 and Frame Relay payload compression.
7. IPX header compression (RFC 1553) as of Cisco IOS Release 11.1(1).
8. “Optional” means a separate Cisco IOS feature set with the IBM base option: IP/IBM base, IP/IPX/IBM base, Desktop/IBM base.
9. RMON events and alarms supported for all interfaces, full nine groups supported for Ethernet interfaces. For security reasons, packet capture only captures packet headers, not data.
10. Supported on access servers (with limited support on router auxiliary ports).
11. NASI is supported in Cisco IOS Release 11.1(2) and later releases.
12. Use of LAT requires terminal license (FS-L8-10.X= for an 8-user license or FS-L16-10.X= for a 16-user license).

Table 164 Cisco IOS Release 11.0 Feature Sets—Cisco Access Server Series

Category	IP Routing	IP/IPX Routing	Desktop	Enterprise	Remote Access Server[1]
LAN support	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE, Novell IPX	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE, Novell IPX, AppleTalk 1 and 2, DECnet IV	IP, transparent and translational bridging[2], concurrent routing and bridging, multiring, LAN extension host, GRE, Novell IPX, AppleTalk 1 and 2, DECnet IV, DECnet V, OSI, XNS, Banyan VINES, Apollo Domain	IP, multiring, GRE, Novell IPX, AppleTalk 1 and 2, DECnet IV
WAN services	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56, IPXWAN 2.0	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56, IPXWAN 2.0	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56, IPXWAN 2.0	HDLC, PPP[3], X.25[4], Frame Relay, IPXWAN 2.0, Switched 56
WAN optimization	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; weighted fair queuing; snapshot routing

Category	IP Routing	IP/IPX Routing	Desktop	Enterprise	Remote Access Server[1]
IP routing	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing, ES-IS, IS-IS	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, policy-based routing
Other routing	–	IPX RIP, NLSP	IPX RIP, NLSP, RTMP, AURP, SMRP	IPX RIP, NLSP, RTMP, AURP, SMRP, SRTP	IPX RIP, RTMP, AURP
IBM support	Optional[7]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), NetView Native Service Point, QLLC[8], Bisync[8]	Optional[7]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), NetView Native Service Point, QLLC[9], Bisync[9] Optional[10]: APPN	Optional[7]: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), NetView Native Service Point, QLLC[9], Bisync[9]	Included: SRB/RSRB, SRT, DLSw+, SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), NetView Native Service Point, QLLC, Bisync, TG/COS, Downstream PU Concentration (DSPU) Optional[10]: APPN	–
Management	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet
Security	Access lists, extended access lists, access security, TACACS+, MD5 routing authentication	Access lists, extended access lists, access security, TACACS+, MD5 routing authentication	Access lists, extended access lists, access security, TACACS+, MD5 routing authentication	Access lists, extended access lists, access security, TACACS+, MD5 routing authentication	Access lists, extended access lists, access security, TACACS+, MD5 routing authentication
Protocol translation	–	–	–	Telnet, LAT, rlogin, TN3270, X.25, PPP	Telnet, LAT, rlogin, TN3270, X.25, PPP
Remote node[11]	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, IPXCP, async master interfaces	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, ARAP 1.0/2.0, IPXCP, MacIP, ATCP	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, IPX and ARAP on virtual async interfaces, ARAP 1.0/2.0, IPXCP, MacIP, ATCP	SLIP, PPP, CSLIP, CPPP, DHCP, IP pooling, async master interfaces, IPX and ARAP on virtual async interfaces, ARAP 1.0/2.0, IPXCP, MacIP, ATCP

Category	IP Routing	IP/IPX Routing	Desktop	Enterprise	Remote Access Server[1]
Terminal services[11]	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD, Xremote, LAT[12], TN3270	Telnet, rlogin, X.25 PAD, XRemote, LAT[12], TN3270
Product numbers	See Table 167.	See Table 167.	See Table 167.	See Table 167.	See Table 167.

1. The Remote Access Server feature set was first introduced in Cisco IOS Release 10.2(4).
2. See the category "IBM Support" for information about source-route bridging (SRB).
3. PPP includes support for LAN protocols supported by the feature set, address negotiation, PAP and CHAP authentication, and PPP compression. Multilink PPP is available in Cisco IOS Release 11.0(4) and later releases.
4. Includes X.25 switching.
5. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization features.
6. X.25 and payload compression. Frame Relay payload compression is available in Cisco IOS Release 11.0(4) and later releases.
7. "Optional" means a separate Cisco IOS feature set with the IBM base option: IP/IBM base, IP/IPX/IBM base, Desktop/IBM base.
8. QLLC and Bisync are available in IP/IBM base in Cisco IOS Release 11.0(3) and later releases.
9. QLLC and Bisync are available in IP/IPX/IBM base and Desktop/IBM base in Cisco IOS Release 11.0(2) and later releases.
10. "Optional" means separate Cisco IOS feature sets: IP/IPX/IBM base/APPN and Enterprise/APPN.
11. Supported on Cisco access servers (with limited support on router auxiliary ports).
12. Use of LAT requires terminal license (FS-L8-10.X= for an 8-user license or FS-L16-10.X= for a 16-user license).

Table 165 Cisco IOS Release 10.3 Feature Sets—Cisco Access Server Series

Category	IP Routing	IP/IPX Routing	Desktop	Enterprise	Remote Access Server[1]
LAN support	IP, transparent and translational bridging[2], multiring, LAN extension host, GRE	IP, transparent and translational bridging[2], multiring, LAN extension host, GRE, Novell IPX	IP, transparent and translational bridging[2], multiring, LAN extension host, GRE, Novell IPX, AppleTalk 1 and 2, DECnet IV	IP, transparent and translational bridging[2], multiring, LAN extension host, GRE, Novell IPX, AppleTalk 1 and 2, DECnet IV, DECnet V, OSI, XNS, Banyan VINES, Apollo Domain	IP, multiring, Novell IPX, GRE, AppleTalk 1 and 2, DECnet IV
WAN services	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, IPXWAN 2.0, Switched 56	HDLC, PPP[3], X.25[4],Frame Relay, ISDN[5], SMDS, IPXWAN 2.0, Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS, IPXWAN 2.0, Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, IPXWAN 2.0, Switched 56
WAN optimization	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing	Header, link, and payload compression[6]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing
IP routing	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP, ES-IS, IS-IS	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, NHRP
Other routing	–	IPX RIP, NLSP	IPX RIP, NLSP[7], RTMP, AURP	IPX RIP, NLSP, RTMP, AURP, SRTP	IPX RIP, RTMP, AURP

Category	IP Routing	IP/IPX Routing	Desktop	Enterprise	Remote Access Server[1]
IBM support	Optional[8]: SRB/RSRB; SRT; DLSw+[9]; SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering; SDLC integration; SDLC-to-LAN conversion (SDLLC); SDLC transport (STUN); Frame Relay SNA Support (RFC 1490)	Optional[10]: SRB/RSRB; SRT; DLSw+[9]; SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering; SDLC integration; SDLC-to-LAN conversion (SDLLC); SDLC transport (STUN); Frame Relay SNA Support (RFC 1490)	Optional[11]: SRB/RSRB; SRT; DLSw+[9]; SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering; SDLC integration; SDLC-to-LAN conversion (SDLLC); SDLC transport (STUN); Frame Relay SNA Support (RFC 1490)	Included: SRB/RSRB; SRT; DLSw+[9]; SNA and NetBIOS WAN optimization via local acknowledgment, caching and filtering; SDLC integration; SDLC-to-LAN conversion (SDLLC); SDLC transport (STUN); Frame Relay SNA Support (RFC 1490); TG/COS, QLLC; Downstream PU Concentration (DSPU)	–
Management	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet
Security	Access lists, extended access lists, access security, TACACS+	Access lists, extended access lists, access security, TACACS+	Access lists, extended access lists, access security, TACACS+	Access lists, extended access lists, access security, TACACS+	Access lists, extended access lists, access security, TACACS+
Protocol translation	–	–	–	Telnet, LAT, rlogin, TN3270, X.25, PPP	Telnet, LAT, rlogin, TN3270, X.25, PPP
Remote node[12]	SLIP, PPP, CSLIP, CPPP, DHCP[13]	SLIP, PPP, CSLIP, CPPP, IPXCP, DHCP[13]	SLIP, PPP, CSLIP, CPPP, ARA 1.0/2.0, IPXCP, MacIP, ATCP[13], DHCP[13]	SLIP, PPP, CSLIP, CPPP, ARA 1.0/2.0, IPXCP, MacIP, ATCP[13], DHCP[13]	SLIP, CSLIP, PPP, CPPP, ARA 1.0/2.0, IPXCP, MacIP, ATCP[13], DHCP[13]
Terminal services[12]	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD, XRemote, LAT[14], TN3270	Telnet, rlogin, X.25 PAD, XRemote, LAT[14], TN3270
Product numbers	See Table 167.	See Table 167.	See Table 167.	See Table 167.	See Table 167.

1. The Remote Access Server feature set was first introduced in Cisco IOS Release 10.2(4).
2. See the chapter "Cisco IOS Software" for information about source-route bridging (SRB).
3. PPP includes support for LAN protocols supported by the feature set, PAP and CHAP authentication, and PPP compression.
4. Includes X.25 switching.
5. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization features.
6. X.25 payload compression.
7. NLSP is supported with the Desktop option in Cisco IOS Release 10.3(2) and later releases.
8. To obtain the IBM base functionality option with the IP routing feature set, order product number SF25CS-10.3.2 or later.
9. DLSw+ is supported in Cisco IOS Release 10.3(2) and later releases.
10. To obtain the IBM base functionality option with the IP/IPX routing feature set, order product number SF25DS-10.3.2 or later.
11. To obtain the IBM base functionality option with the Desktop routing feature set, order product number SF25BS-10.3.2 or later.
12. Supported on access servers (with limited support on router auxiliary ports).
13. ATCP and DHCP proxy client is supported in Cisco IOS Release 10.3(3) and later releases.
14. Use of LAT requires terminal license (FS-L8-10.X= for an 8-user license or FS-L16-10.X= for a 16-user license).

Table 166 Cisco IOS Release 10.2 Feature Sets—Cisco Access Server Series

Category	IP Routing	IP/IPX Routing[1]	Desktop	Enterprise	Remote Access Server[2]
LAN support	IP; transparent, translational, and source-route bridging; LAN extension host; GRE	IP; transparent, translational, and source-route bridging; LAN extension host; GRE; Novell IPX	IP; transparent, translational, and source-route bridging; LAN extension host; GRE; Novell IPX; AppleTalk Phase 1 and 2; DECnet IV	IP; transparent, translational, and source-route bridging; LAN extension host; GRE; Novell IPX; AppleTalk Phase 1 and 2; DECnet IV; DECnet V; XNS; Banyan VINES; OSI; Apollo Domain	IP, multiring, GRE, Novell IPX, AppleTalk 1 and 2, DECnet IV
WAN services	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], SMDS[6], Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], IPXWAN, SMDS[6], Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], IPXWAN, SMDS[6], Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, ISDN[5], IPXWAN, SMDS, Switched 56	HDLC, PPP[3], X.25[4], Frame Relay, IPXWAN 2.0, Switched 56
WAN optimization	Header, link, and payload compression[7]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing	Header, link, and payload compression[7]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing	Header, link, and payload compression[7]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing	Header, link, and payload compression[7]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing	Header, link, and payload compression[7]; dial-on-demand; dial backup; bandwidth-on-demand; custom and priority queuing; snapshot routing
IP routing	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM, ES-IS, IS-IS	RIP, IGRP, Enhanced IGRP, OSPF, BGP, EGP, PIM
Other routing	–	IPX RIP	IPX RIP, RTMP, AURP	IPX RIP, RTMP, AURP, SRTP	IPX RIP, RTMP, AURP
IBM support	Optional[8]: RSRB; SNA and NetBIOS WAN optimization via local acknowledgment, caching, and filtering[9]	Optional[8]: RSRB; SNA and NetBIOS WAN optimization via local acknowledgment, caching, and filtering[10]	Optional[8]: RSRB; SNA and NetBIOS WAN optimization via local acknowledgment, caching, and filtering[11]	Included: RSRB; SNA and NetBIOS WAN optimization via local acknowledgment, caching, and filtering; SDLC integration; SDLC-to-LAN conversion (SDLLC); SDLC transport (STUN); TG/COS; QLLC	–
Management	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet	AutoInstall, SNMP, Telnet
Security	Access lists, extended access lists, access security, TACACS	Access lists, extended access lists, access security, TACACS	Access lists, extended access lists, access security, TACACS	Access lists, extended access lists, access security, TACACS	Access lists, extended access lists, access security, TACACS
Protocol translation	–	–	–	Telnet, LAT, rlogin, TN3270, X.25	Telnet, LAT, rlogin, TN3270, X.25

Category	IP Routing	IP/IPX Routing[1]	Desktop	Enterprise	Remote Access Server[2]
Remote node[12]	SLIP, PPP, CSLIP, CPPP	SLIP, PPP, CSLIP, CPPP, IPXCP	SLIP, PPP, CSLIP, CPPP, ARA 1.0/2.0, IPXCP, MacIP	SLIP, PPP, CSLIP, CPPP, ARA 1.0/2.0, IPXCP, MacIP	SLIP, PPP, CSLIP, CPPP, ARA 1.0/2.0, IPXCP, MacIP
Terminal services[12]	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD, Xremote, LAT[13], TN3270	Telnet, rlogin, X.25 PAD, XRemote, LAT[13], TN3270
Product numbers	See Table 167.	See Table 167.	See Table 167.	See Table 167.	See Table 167.

1. Only available with Cisco IOS Release 10.2(2) and later releases.
2. The Remote Access Server feature set was first introduced in Cisco IOS Release 10.2(4).
3. PPP includes support for LAN protocols supported by the feature set, address negotiation, and PAP and CHAP authentication.
4. Includes X.25 switching.
5. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization.
6. Prior to Cisco IOS Release 10.2(2), SMDS was only available as part of the Enterprise set.
7. X.25 payload compression.
8. "Optional" means a separate Cisco IOS feature set with the IBM base option: IP/IBM base, IP/IPX/IBM base, or Desktop/IBM base.
9. To obtain the IBM base functionality option with the IP routing feature set, order product number SF25CS-10.2.2 or later.
10. To obtain the IBM base functionality option with the IP/IPX routing feature set, order product number SF25DS-10.2.2 or later.
11. To obtain the IBM base functionality option with the Desktop feature set, order product number SF25BS-10.2.2 or later.
12. Supported on access servers (with limited support on router auxiliary ports).
13. Use of LAT requires terminal license (FS-L8-10.X.X for an 8-user license or FS-L16-10.X= for a 16-user license).

Table 167 lists the software feature set product numbers for the Cisco 2500 series and AS5100 access servers for Cisco IOS Releases 11.1, 11.0, 10.3, and 10.2. For additional details about how to order software updates and upgrades, see the section "Software Ordering Examples" in the chapter "Cisco IOS Software."

Note All models include a minimum of 4-MB Flash memory; however, depending on the Cisco IOS release feature set that you order with the system, it might require more memory. Refer to Table 171 and Table 172, later in this chapter, for the minimum Flash memory required for each feature set. Refer to Table 187 for ordering information.

Table 167 Cisco IOS Software Product Numbers—Cisco 2500 Series and AS5100 Access Servers

Description	Product Number[1]
IP	SF25C-xx.x.x SW25C-xx.x.x=
IP with IBM base	SF25CS-xx.x.x SW25CS-xx.x.x=
IP/IPX	SF25D-xx.x.x SW25D-xx.x.x=
IP/IPX with IBM base	SF25DS-xx.x.x SW25DS-xx.x.x=
IP/IPX with IBM base and APPN[2]	SF25DSN-xx.x.x SW25DSN-xx.x.x=
Desktop	SF25B-xx.x.x SW25B-xx.x.x=

Description	Product Number[1]
Desktop with IBM base	SF25BS-xx.x.x SW25BS-xx.x.x=
Enterprise	SF25A-xx.x.x SW25A-xx.x.x=
Enterprise with APPN[2]	SF25AN-xx.x.x SW25AN-xx.x.x=
Remote Access Server	SW25E-xx.x.x=
IP and RMON	SF25CR-xx.x.x SW25CR-xx.x.x
IP with IBM and RMON	SF25CSR-xx.x.x SW25CSR-xx.x.x
IP/IPX and RMON	SF25DR-xx.x.x SW25DR-xx.x.x
IP/IPX with IBM and RMON	SF25DSR-xx.x.x SW25DSR-xx.x.x
Enterprise and RMON	SF25AR-xx.x.x SW25AR-xx.x.x

1. Substitute the release number for xx.x.x in the product number (for example, SW-25C-11.1.1=).
2. Not available for the Cisco AS5100 access server.

Table 168 lists the software feature set product numbers for the Cisco AS5200 access server for Cisco IOS Release 11.1.

Note Depending on the Cisco IOS release feature set that you order with the system, it might require more memory than comes standard with the system. Refer to Table 173, later in this chapter for the minimum memory required for each feature set. Refer to Table 188 for ordering information.

Table 168 Cisco IOS Software Product Numbers—Cisco AS5200 Access Server

Description	Product Number[1]
IP	SF52C-xx.x.x
IP/IPX	SF52D-xx.x.x
Desktop	SF52B-xx.x.x
Enterprise	SF52A-xx.x.x
IP/Modem	SF52CR-xx.x.x
IP/IPX/Modem	SF52DR-xx.x.x
Desktop/Modem	SF52BR-xx.x.x
Enterprise/Modem	SF52AR-xx.x.x
Enterprise/RMON/Modem	SF52ARM-xx.x.x

1. Substitute the release number for xx.x.x in the product number (for example, SW-25C-11.1.1=).

Feature sets for Cisco IOS software releases can be upgraded for the Cisco 2500 series and AS5100 access servers, as described in Table 169. To order an upgrade, you must use two product numbers; one represents the upgrade license, and the other represents the software. For example, to upgrade from an IP feature set to an IP feature set with IBM base functionality, order product number FR25-CCS= (the upgrade license) and SW25CS-xx.x.x= (the software). To upgrade to a feature set with APPN, you must first purchase the upgrade license for the desired feature set and then purchase the upgrade license and upgrade software for the APPN feature set.

Table 169 Cisco IOS Software Upgrades—Cisco 2500 Series and AS5100 Access Servers

Feature Set Upgrade	Product Number[1]
IP to IP with IBM base functionality	FR25-CCS= and SW25CS-xx.x.x=
IP to IP/IPX	FR25-CD= and SW25D-xx.x.x=
IP to IP/IPX with IBM base functionality	FR25-CDS= and SW25DS-xx.x.x=
IP to IP/IPX with IBM base functionality and APPN[2]	FR25-CDS=, FR25-APPN=, and SW25DSN-xx.x.x=
IP to Desktop	FR25-CB= and SW25B-xx.x.x=
IP to Desktop with IBM base functionality	FR25-CBS= and SW25BS-xx.x.x=
IP to Enterprise	FR25-CA= and SW25A-xx.x.x=
IP to Enterprise and APPN[2]	FR25-CA=, FR25-APPN=, and SW25AN-xx.x.x=
IP with IBM base to IP/IPX with IBM base functionality	FR25-CSDS= and SW25DS-xx.x.x=
IP with IBM base to IP/IPX with IBM base functionality and APPN[2]	FR25-CSDS=, FR25-APPN=, and SW25DSN-xx.x.x=
IP with IBM base to Desktop with IBM base functionality	FR25-CSBS= and SW25BS-xx.x.x=
IP with IBM base to Enterprise	FR25-CSA= and SW25A-xx.x.x=
IP with IBM base to Enterprise and APPN[2]	FR25-CSA=, FR25-APPN=, and SW25AN-xx.x.x=
IP/IPX to IP/IPX with IBM base functionality	FR25-DDS= and SW25DS-xx.x.x=
IP/IPX to IP/IPX with IBM base functionality and APPN[2]	FR25-DDS=, FR25-APPN=, and SW25DSN-xx.x.x=
IP/IPX to Desktop	FR25-DB= and SW25B-xx.x.x=
IP/IPX to Desktop with IBM base functionality	FR25-DBS= and SW25BS-xx.x.x=
IP/IPX to Enterprise	FR25-DA= and SW25A-xx.x.x=
IP/IPX to Enterprise and APPN[2]	FR25-DA=, FR25-APPN=, and SW25AN-xx.x.x=
IP/IPX with IBM base to Desktop with IBM base functionality	FR25-DSBS= and SW25BS-xx.x.x=
IP/IPX with IBM base to Enterprise	FR25-DSA= and SW25A-xx.x.x=
IP/IPX with IBM base to Enterprise and APPN[2]	FR25-DSA=, FR25-APPN=, and SW25AN-xx.x.x=
IP/IPX with IBM base to IP/IPX with IBM base and APPN[2]	FR25-APPN= and SW25DSN-xx.x.x=
Desktop to Desktop with IBM base functionality	FR25-BBS= and SW25BS-xx.x.x=

Feature Set Upgrade	Product Number[1]
Desktop to Enterprise	FR25-BA= and SW25A-xx.x.x=
Desktop to Enterprise and APPN[2]	FR25-BA=, FR25-APPN=, and SW25AN-xx.x.x=
Desktop with IBM base to Enterprise	FR25-BSA= and SW25A-xx.x.x=
Desktop with IBM base to Enterprise and APPN[2]	FR25-BSA=, FR25-APPN=, and SW25AN-xx.x.x=
IP to IP/RMON	FR25-R= and SW25CR-x.x.x=
IP to IP/IBM/RMON	FR25-CCS=, FR25-R=, and SW25CSR-x.x.x=
IP to IP/IPX/RMON	FR25-CD=, FR25-R=, and SW25DR-x.x.x=
IP to IP/IPX/IBM/RMON	FR25-CDS=, FR25-R=, and SW25DSR-x.x.x=
IP to Enterprise/RMON	FR25-CA=, FR25-R=, and SW25AR-x.x.x=
IP/RMON to IP/IBM/RMON	FR25-CCS= and SW25CSR-x.x.x=
IP/RMON to IP/IPX/RMON	FR25-CD= and SW25DR-x.x.x=
IP/RMON to IP/IPX/IBM/RMON	FR25-CDS= and SW25DSR-x.x.x=
IP/RMON to Enterprise/RMON	FR25-CA= and SW25AR-x.x.x=
IP/IBM to IP/IBM/RMON	FR25-R= and SW25CSR-x.x.x=
IP/IBM to IP/IPX/IBM/RMON	FR25-CSDS=, FR25-R=, and SW25DSR-x.x.x=
IP/IBM to Enterprise/RMON	FR25-CSA=, FR25-R=, and SW25AR-x.x.x=
IP/IBM/RMON to IP/IPX/IBM/RMON	FR25-CSDS= and SW25DSR-x.x.x=
IP/IBM/RMON to Enterprise/RMON	FR25-CSA= and SW25AR-x.x.x=
IP/IPX to IP/IPX/RMON	FR25-R= and SW25DR-x.x.x=
IP/IPX to IP/IPX/IBM/RMON	FR25-DDS=, FR25-R=, and SW25DSR-x.x.x=
IP/IPX to Enterprise/RMON	FR25-CSA=, FR25-R=, and SW25AR-x.x.x=
IP/IPX/RMON to IP/IPX/IBM/RMON	FR25-DDS= and SW25DSR-x.x.x=
IP/IPX/RMON to Enterprise/RMON	FR25-DA= and SW25AR-x.x.x=
IP/IPX/IBM to IP/IPX/IBM/RMON	FR25-R= and SW25DSR-x.x.x=
IP/IPX/IBM to Enterprise/RMON	FR25-DSA=, FR25-R=, and SW25AR-x.x.x=
IP/IPX/IBM/RMON to Enterprise/RMON	FR25-DSA= and SW25AR-x.x.x=
Desktop to Enterprise/RMON	FR25-BA=, FR25-R=, and SW25AR-x.x.x=
Desktop/IBM to Enterprise/RMON	FR25-BSA=, FR25-R=, and SW25AR-x.x.x=
Enterprise to Enterprise/RMON	FR25-R= and SW25AR-x.x.x=

1. For Cisco IOS Release 11.1, 11.0, 10.3, and 10.2, substitute the release number for xx.x.x in the product number (for example, SW25D-11.1.1=).
2. Not available for the Cisco AS5100 access server.

Table 170 lists the feature set upgrades and corresponding product numbers for the AS5210 access server, which is a bundled system that comes with an IP feature set.

Table 170 Cisco IOS Software Upgrades—Cisco AS5210 Access Server

Feature Set Upgrade	Product Number
IP to IP/IPX	AS5210-IP/IPX-UPGD
IP to Desktop	AS5210-DT-UPGD
IP to Enterprise	AS5210-ENT-UPGD
IP to IP/Modem	AS5210-IP/RM-UPGD
IP to IP/IPX/Modem	AS5210-IP/IPX/RM-UPGD
IP to Desktop/Modem	AS5210-DT/RM-UPGD
IP to Enterprise/Modem	AS5210-ENT/RM-UPGD

Adding a feature set may require you to purchase additional memory. The minimum memory requirements for Cisco 2500 series, AS5100, and AS5200 access servers are listed in Table 171, Table 172, and Table 173, respectively. The minimum memory requirements listed were chosen for typical branch and remote office applications. If your network is very large, using complex routing protocols, or using RMON, you may need more memory. Configuration analysis and testing are encouraged.

Table 171 Minimum Memory Requirements for Cisco IOS Release 11.1, 11.0, 10.3, and 10.2 Feature Sets—Cisco 2500 Series Access Server

	Cisco IOS Release 11.1		Cisco IOS Release 11.0		Cisco IOS Release 10.3		Cisco IOS Release 10.2	
Feature Set	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]
IP	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB
IP with IBM base	8 MB	4 MB	8 MB	4 MB	4 MB	4 MB	4 MB	4 MB
IP/IPX	8 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB
IP/IPX with IBM base	8 MB	4 MB	8 MB	4 MB	8 MB	4 MB	4 MB	4 MB
IP/IPX with IBM base and APPN	8 MB	8 MB	8 MB	8 MB	–	–	–	–
Desktop	8 MB	4 MB	8 MB	4 MB	4 MB	4 MB	4 MB	4 MB
Desktop with IBM base	8 MB	4 MB	8 MB	4 MB	8 MB	4 MB	4 MB	4 MB
Enterprise	8 MB	6 MB	8 MB	6 MB	8 MB	6 MB	8 MB	6 MB
Enterprise and APPN[2]	16 MB	8 MB	8 MB	8 MB	–	–	–	–
Remote Access Server	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB
IP and RMON[3]	4 MB	4 MB	–	–	–	–	–	–
IP with IBM base and RMON[3]	8 MB	4 MB	–	–	–	–	–	–
IP/IPX and RMON[3]	8 MB	4 MB	–	–	–	–	–	–

Feature Set	Cisco IOS Release 11.1		Cisco IOS Release 11.0		Cisco IOS Release 10.3		Cisco IOS Release 10.2	
	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]
IP/IPX with IBM base and RMON[3]	8 MB	4 MB	–	–	–	–	–	–
Enterprise and RMON[3]	8 MB	6 MB	–	–	–	–	–	–

1. The total DRAM memory is the total combined primary and shared DRAM memory. See Table 174.
2. Dual bank Flash memory is not supported with the Enterprise and APPN feature set.
3. An Ethernet segment with 50 nodes and 10 hosts or more requires more memory, particularly when promiscuous rather than native mode is chosen. In native mode, only the packets traversing the router are monitored. In promiscuous mode, everything on the Ethernet segment is monitored.

Table 172 Minimum Memory Requirements for Cisco IOS Release 11.1, 11.0, 10.3, and 10.2 Feature Sets—Cisco AS5100 Access Server

Feature Set	Cisco IOS Release 11.1		Cisco IOS Release 11.0		Cisco IOS Release 10.3		Cisco IOS Release 10.2	
	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]	Flash Memory	Total DRAM Memory[1]
IP	4 MB	6 MB	4 MB	6 MB	4 MB	6 MB	4 MB	6 MB
IP with IBM base	8 MB	6 MB	8 MB	6 MB	4 MB	6 MB	4 MB	6 MB
IP/IPX	8 MB	6 MB	4 MB	6 MB	4 MB	6 MB	4 MB	6 MB
IP/IPX with IBM base	8 MB	6 MB	8 MB	6 MB	8 MB	6 MB	4 MB	6 MB
Desktop	8 MB	6 MB	8 MB	6 MB	4 MB	6 MB	4 MB	6 MB
Desktop with IBM base	8 MB	6 MB	8 MB	6 MB	8 MB	6 MB	4 MB	6 MB
Enterprise	8 MB	6 MB	8 MB	6 MB	8 MB	6 MB	8 MB	6 MB
Remote Access Server	4 MB	6 MB	4 MB	6 MB	4 MB	6 MB	4 MB	6 MB

1. The total DRAM memory is the total combined primary and shared DRAM memory. See Table 175.

Table 173 Minimum Memory Requirements for Cisco IOS Release 11.1 Feature Set—Cisco AS5200 Access Server

Feature Set	Boot Flash Memory	Main DRAM Memory	System Flash Memory	Shared DRAM Memory
IP	4 MB	4 MB	8 MB	4 MB
IP/IPX	4 MB	4 MB	8 MB	4 MB
Desktop	4 MB	4 MB	8 MB	4 MB
Enterprise	4 MB	8 MB	8 MB	4 MB
IP and Modem	4 MB	4 MB	8 MB	4 MB
IP/IPX and Modem	4 MB	4 MB	8 MB	4 MB
Desktop and Modem	4 MB	4 MB	8 MB	4 MB

Feature Set	Boot Flash Memory	Main DRAM Memory	System Flash Memory	Shared DRAM Memory
Enterprise and Modem	4 MB	8 MB	8 MB	4 MB
Enterprise/RMON/Modem	4 MB	8 MB	8 MB	4 MB

There are two types of DRAM memory in the Cisco 2500 series and AS5100 access servers: primary and shared (packet). Primary memory is used to store the operating configuration, routing tables, caches, queues, and packets. Shared memory is used to store incoming and outgoing packets. In Table 174 and Table 175, the physical configuration column lists the amount of fixed DRAM and DRAM SIMM memory supported. The system usage column lists how the system allocates the total DRAM memory installed.

Table 174 Recommended Shared and Primary DRAM Memory—Cisco 2500 Series Access Servers

	Physical Configuration		System Usage	
Total DRAM Memory	Fixed DRAM[1]	DRAM SIMM	Shared DRAM Memory	Primary DRAM Memory
4 MB	–	4 MB	2 MB	2 MB
6 MB	2 MB	4 MB	2 MB	4 MB
8 MB	–	8 MB	2 MB	6 MB
10 MB	2 MB	8 MB	2 MB	8 MB
16 MB	–	16 MB	2 MB	14 MB
18 MB	2 MB	16 MB	2 MB	16 MB

1. Fixed DRAM is soldered on the system card. Depending on the Cisco IOS feature originally ordered, the system may or may not include fixed DRAM.

Table 175 Recommended Shared and Primary DRAM Memory—Cisco AS5100 Access Servers

	Physical Configuration		System Usage	
Total DRAM Memory	Fixed DRAM[1]	DRAM SIMM	Shared DRAM Memory	Primary DRAM Memory
6 MB	2 MB	4 MB	2 MB	4 MB
10 MB	2 MB	8 MB	2 MB	8 MB
18 MB	2 MB	16 MB	2 MB	16 MB

1. Each AS5100 card (AS51-16A-E) ships with 2 MB of fixed DRAM memory soldered on the card.

LAT Terminal License

A LAT terminal license is required to use with each asynchronous interface to which a LAT terminal is connected. Table 176 lists the licenses available and the corresponding product numbers.

Table 176 Optional LAT Terminal Licenses

Description	Cisco Access Server 2500 Series	Cisco Access Server AS5100
8-user LAT terminal license	FS-L8-10.X=	FS-L8-10.X=
16-user LAT terminal license	FS-L16-10.X=	FS-L16-10.X=
48-user LAT terminal license	–	FS-L48-10.X=

CiscoRemote Software

CiscoRemote is a scalable and comprehensive solution for remote access client software. There are two types of CiscoRemote software: CiscoRemote Lite and CiscoRemote Plus. Both products are optimized for easy installation and tuned for operation with Cisco access servers. CiscoRemote extends the benefits of Cisco IOS software capabilities to the desktop and provides a complete solution when used with Cisco access servers or remote node products (such as the Cisco 203 and Cisco 204).

CiscoRemote Lite provides basic remote node connectivity to an enterprise network. This basic connectivity package includes an installer, dialer, modem discovery, TCP/IP VxD stack, PPP or SLIP over IP or IPX. You can use CiscoRemote Lite with Windows 3.1, Windows for Workgroup, or Windows 95. CiscoRemote Lite is available free of charge on CCO (Cisco Connection Online, URL http://www.cisco.com) for an unlimited number of clients, provided that it is used to dial in to a Cisco device. The software is not licensed for use with any other vendor's hardware.

CiscoRemote Plus combines a complete set of applications for dial-up remote computing in one software package—a complete solution for enterprise network, remote access, and Internet communications. All applications are optimized, tested, and supported by Cisco Systems. CiscoRemote Plus links PCs with other computing resources within an enterprise network or across the Internet. Using CiscoRemote Plus, you can browse the World Wide Web, transfer files, log on to remote hosts, access Internet news groups, or share documents in real-time collaborative sessions. The software also provides the industry’s first remote-node accelerator for dramatically improving dial-up performance. CiscoRemote Plus also has LAN support for attached Ethernet devices such as the Cisco 753 router. CiscoRemote Plus provides all these features at a fraction of the cost of the individual components. CiscoRemote Plus is designed for the demands of an enterprise network, yet its ease of use makes it equally well suited to connect an individual at home to the Internet.

Note CiscoRemote is licensed and sold on a per-user basis.

Table 177 CiscoRemote Lite and CiscoRemote Plus—Comparison of Features

Feature	CiscoRemote Lite (Version 2.0)	CiscoRemote Plus (Version 2.0)
Windows 3.1, Windows for Workgroups, and Windows 95 support	X	X
One-step installation	X	X
Windows-based dialer	X	X
TCP/IP protocol (VxD)	X	X
PPP/SLIP	X	X
Automatic modem detection	X	X
LAN driver (NDIS / ODI) for ISDN	–	X
PAP/CHAP	X	X
Windows sockets and NetBIOS (APIs)	X	X
Telnet and ping	X	X
DHCP support	X	X
SNMP (MIB II)	X	X
Callback RFC 1570	X	X
VJ header compression	X	X
Remote node accelerator (Powerburst)	–	X
Remote control (Timbuktu)	–	X
E-mail (Beyond Mail)	–	X
Netscape Navigator Browser, Version 2.0	–	X
Document conferencing (DataBeam)	–	X
ITU T.120 compatibility	–	X
TN3270	–	X
TFTP server	–	X
FTP client and server	–	X
Software and user guide on CD	–	X

Table 178 CiscoRemote Plus Product Numbers

Description	Product Numbers
CiscoRemote Plus for Windows, 1-user license	CISCOREMOTE-V2.0
CiscoRemote Plus, 500-user license	CRPLUS-500-V2.0
CiscoRemote Plus, 1000-user license	CRPLUS-1K-V2.0
CiscoRemote Plus, 5000-user license	CRPLUS-5K-V2.0
CiscoRemote Plus, 10,000-user license	CRPLUS-10K-V2.0
AirSoft software for the PowerBurst Server	PBAGENT-1-V1.0

CiscoSecure UNIX Server

CiscoSecure UNIX Server is a network security server that controls and secures access to a network via dial-up modems or ISDN. It can also secure internal or external access to routers within a network. Network Access security involves three sets of requirements: authentication, authorization, and accounting, referred to as AAA. CiscoSecure utilizes a central database storing user and group profiles of authentication and authorization information. When a user attempts to login to a network, the router communicates with CiscoSecure using the TACACS+ security protocol. CiscoSecure authenticates the user and sets the authorization parameters to determine the user's privilege levels. At the same time it stores accounting information that can be used for security audits or account billing.

Using CiscoSecure, a network administrator can control the following:

- Who can log in to the network
- What privileges each user has in the network
- What accounting information is recorded in terms of security audits or account billing

Table 179 provides CiscoSecure UNIX Server specifications.

Table 179 CiscoSecure UNIX Server Specifications

Description	Specifications
Hardware requirements	UNIX SPARCstation 32-MB RAM 64-MB swap Minimum of 200 MB of free disk space per 1000 users One 3.5-inch floppy drive
Software requirements	SunOS 4.1.3/4.1.4 Solaris 2.5 Cisco IOS Release 10.3 or later

Table 180 lists the CiscoSecure UNIX Server product numbers. Note that *ports/sessions* means the number of ports when using modems or B channels when using ISDN.

Table 180 CiscoSecure UNIX Server Product Numbers

Description	Product Number
CiscoSecure UNIX Server base unit—16 ports/sessions	CSUS-1.0-B16
CiscoSecure UNIX Server base unit—48 ports/sessions	CSUS-1.0-B48
CiscoSecure UNIX Server base unit—192 ports/sessions	CSUS-1.0-B192
CiscoSecure UNIX Server base unit—1024 ports/sessions	CSUS-1.0-B1024
CiscoSecure UNIX Server add-on—16 ports/sessions	CSUS-1.0-A16
CiscoSecure UNIX Server add-on—48 ports/sessions	CSUS-1.0-A48
CiscoSecure UNIX Server add-on—192 ports/sessions	CSUS-1.0-A192
CiscoSecure UNIX Server add-on—1024 ports/sessions	CSUS-1.0-A1024

Cisco 2500 Series Access Servers

The Cisco 2500 series access servers provide a variety of models designed for small office and remote site environments. Each model is a fixed-configuration router that supports at least two interface types. Each access server comes standard with Flash EPROM technology for simplified software maintenance. For software, the Cisco 2500 series access servers offer a wide choice of feature sets, so you can select the appropriate protocol set for your network environment. These feature sets range from IP and bridging-only to a feature set containing the full array of Cisco's software functionality. Table 181 lists the product numbers for the Cisco 2500 series access servers.

Table 181 Cisco 2500 Series Access Server Product Numbers

Model	Description	Product umber
Cisco 2509	1 Ethernet port, 2 serial ports, 8 asynchronous ports, AC power supply	CISCO2509
Cisco 2509-DC	1 Ethernet port, 2 serial ports, 8 asynchronous ports, DC power supply	CISCO2509-DC
Cisco 2510	1 Token Ring port, 2 serial ports, 8 asynchronous ports, AC power supply	CISCO2510
Cisco 2511	1 Ethernet port, 2 serial ports, 16 asynchronous ports, AC power supply	CISCO2511
Cisco 2511-DC	1 Ethernet port, 2 serial ports, 16 asynchronous ports, DC power supply	CISCO2511-DC
Cisco 2512	1 Token Ring port, 2 serial ports, 16 asynchronous ports, AC power supply	CISCO2512

Figure 80 Cisco 2509 Rear Panel

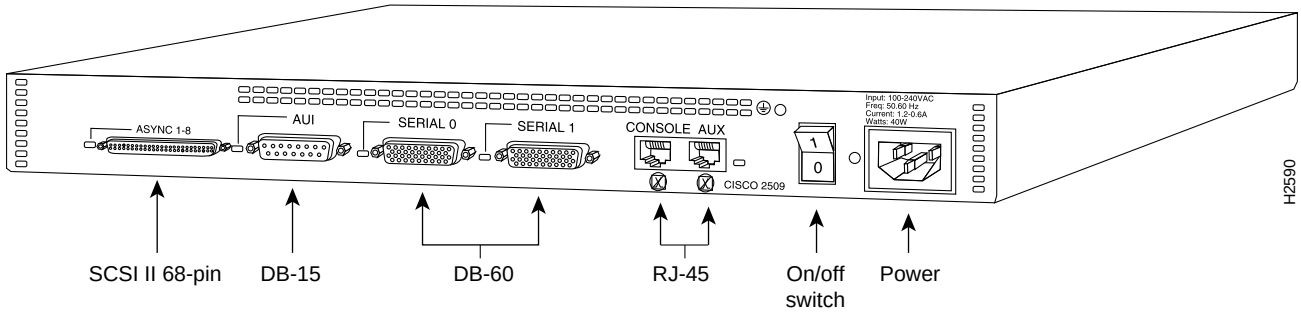


Figure 81 Cisco 2510 Rear Panel

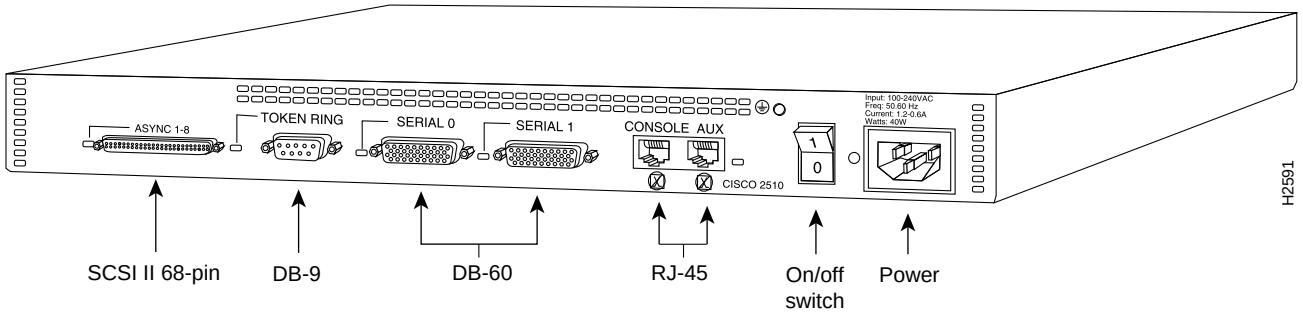


Figure 82 Cisco 2511 Rear Panel

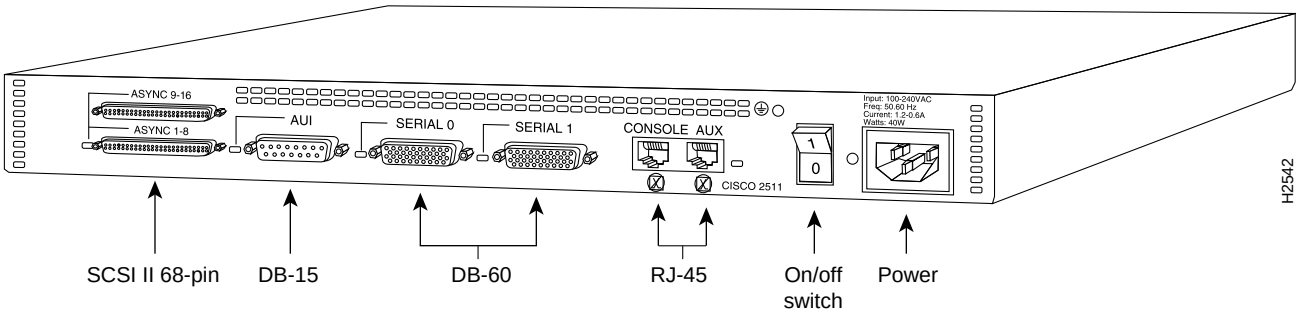
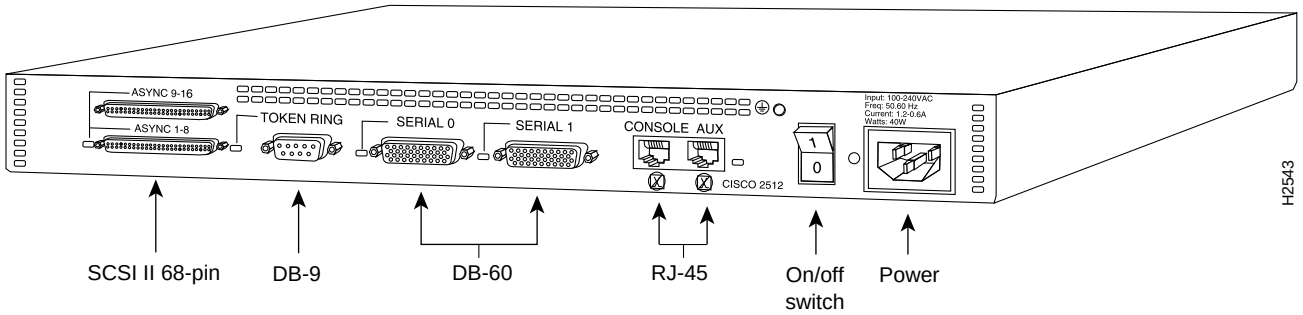


Figure 83 Cisco 2512 Rear Panel



Cisco AS5100 Access Server

The Cisco AS5100 access server is a versatile data communications platform that combines in one chassis the functions of a Cisco access server with analog and digital modems, CSUs, and T1 channel banks.

The Cisco AS5100 access server provides the greatest benefit for organizations that need to centralize processing capabilities for remote offices and LANs. It enables organizations to aggregate their modem traffic onto analog or digital telephone lines and route it through the Public Switched Telephone Network (PSTN).

The Cisco AS5100 access server is optimized for high-speed modem access, and is ideally suited for all traditional dial-up applications, such as access to a host, electronic mail, file transfer, and dial-in access to a LAN.

The Cisco AS5100 access server is available with the following modems:

- Quad V.32*bis*Plus modems, which connect at rates up to 21.6 kbps
- Quad V.34 modems, which connect at rates up to 28.8 kbps.

Each of the V.32 or V.34 modems is available as digital, analog, or analog/digital.

Figure 84 Cisco AS5100 Access Server Front Panel

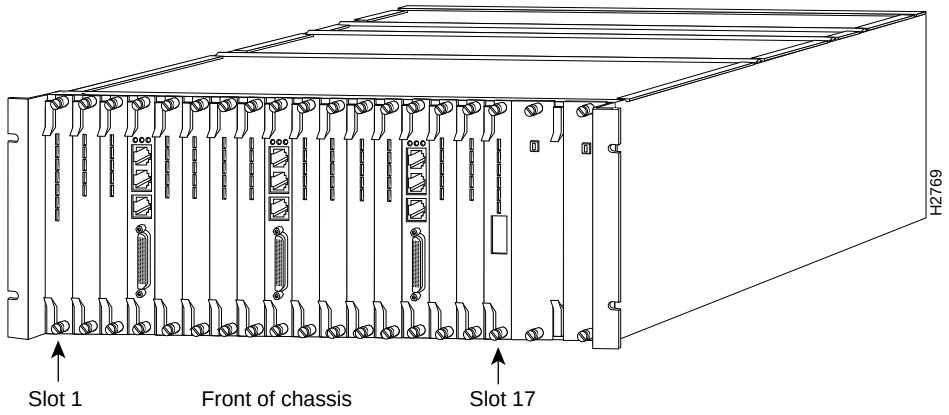
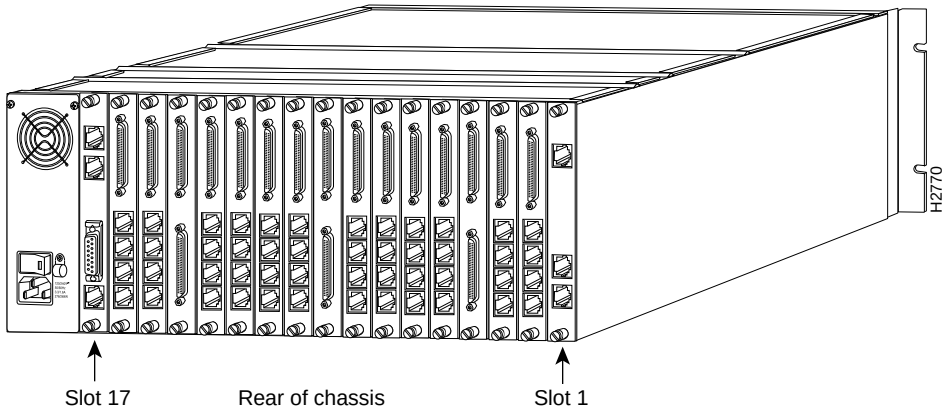
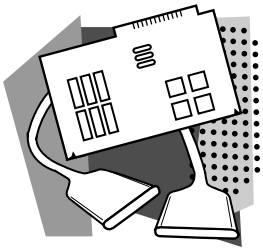


Figure 85 Cisco AS5100 Access Server Rear Panel





Hardware Details

The Cisco AS5100 access server consists of the following components:

- One 19-inch chassis with 17 card slots and a high-speed, multilayer midplane that spans the length of the chassis.
- Up to 16 NACs that are inserted into the front of the chassis. The NACs are paired with associated NICs that are inserted into the rear of the chassis.
- One management NAC (always in slot 17) and its associated NIC.
- One or two power supplies inserted into the front of the chassis. The second power supply provides redundancy in case of failure.

Chassis/Chassis Midplane

The Cisco AS5100 access server is built around a three-bus chassis that can be managed by optional SNMP management software.

The midplane design supports a wide array of NACs and NICs that can be configured and installed in the chassis to meet diverse connectivity needs. The chassis provides 17 connectors in front for NACs, and 17 connectors in the rear for NICs. All NACs and most NICs can support hot-swapping, which allows you to insert and remove cards while the power is on.

Power Supply

Optional AC or DC-powered chassis are available. DC power is supplied to the installed NICs and NACs via connectors in the midplane. All configured chassis from Cisco Systems include two power supplies. One unit provides sufficient power to a fully loaded chassis, and the second provides full redundancy.

T1 Cards

The T1 NIC provides a four-wire T1 interface to the Cisco AS5100 access server, and the T1 NAC provides mapping of individual DS0s to the quad modem NACs across the Time Division Multiplexer (TDM) bus.

The T1 NIC is available as a dual-trunk version, which handles up to 48 DS0 channels from two trunks. Each channel carries either a pulse code modulation (PCM)-encoded voice channel or digital data. The T1 NAC supports 64-kbps clear channel operation for data channels, and supports Feature Group B for voice channels. Again, each of the DS0 channels connect to other NACs via the midplane.

The T1 NIC provides RJ-48 connector(s) to terminate the trunk(s). It also provides an RJ-45 connector for the EIA/TIA-232 interface port. The T1 NIC performs all CSU functions including auto equalization and auto gain functions to support 6000 feet of 24-gage shielded cable. This card complies with all Bell Core standards relating to T1 alarms, loopbacks, error detection, and so forth. The T1 NIC is compatible with an external CSU if desired, and provides a serial interface to the T1 NAC.

The T1 NAC allows you to use dial number identification string (DNIS) and automatic number identification (ANI) information provided by the public 950 services, Feature Groups B and D, and enhanced 800 services to route data. Using this call information, the Cisco AS5100 access server chassis can independently configure the specific modems according to the dialed number requirements.

The T1 cards support the following features:

- Dual T1 interface supports up to 48 DS0s
- D4 or ESF frame formats
- AMI or B8ZS line coding
- Integral CSU
- Internal and loop timing source from either span line
- Automatic fallback to alternate timing source
- Configurable E&M Type II signaling support
- Supports ground start and loop start supervision
- Supports MF and DTMF addressing
- LEDs for Run/Fail, Carrier, Loopback, and Alarm status
- Bantam monitor jacks for span lines on T1 NIC

Management Cards

The network management NAC and NIC cards act as proxy agents for the T1 and modem cards in the chassis. The NAC and NIC cards communicate with the T1 and modem cards over a dedicated management bus on the midplane. An SNMP console communicates with the management cards via a serial console port or over a LAN interface. Total Control Manager (TCM) software provides users with easy and immediate access to configuration/management of the modem and T1 card sets.

Access Server Cards

The access server NAC and associated NIC cards function as a communications server system with 16 asynchronous serial ports, one synchronous serial port, and one 10BaseT Ethernet port. Up to three access server cards can be installed in each Cisco AS5100 access server chassis. Each one is functionally equivalent to a standalone Cisco 2511, with the following exceptions:

- Each of the two 68-pin asynchronous serial ports supports eight EIA/TIA-232 serial ports.
- A supplied breakout cable splits each 68-pin port into two 50-pin connectors, which each support a quad modem card connected at the modem NIC.

Modem Cards

Each chassis houses up to 48 high-speed analog or digital modems. Digital modems connect to the phone system by a direct T1 link through the T1 NIC. Modems can be managed with software ranging from a simple terminal interface menu system for device configuration or via SNMP using the network management card.

The quad modem cards provide four dial-up modems on a single card. Each modem is capable of supporting V.32 or V.34 and MNP-5 or V.42/V.42*bis* error correction and data compression.

The modem can also make use of the DNIS and ANI information provided by the public 950 services, Feature Groups B and D, and enhanced 800 services to customize the configuration of the modem before answering a call. For example, the dialed phone number can be associated with specific applications, and the same modem pool can be dynamically configured on a call-by-call basis to adjust to the requirements of the application.

The Quad EIA/TIA-232 NIC provides the physical interface for four EIA/TIA-232 ports via a 50-pin connector on the rear of the card.

Each EIA/TIA-232 port supports the full complement of EIA/TIA-232 signals necessary for synchronous or asynchronous operation. The ports support operation at speeds up to 115.2 kbps, and provide four serial interfaces to the quad modem NAC.

The modem cards support the following features:

- DTE interface:
  - Supports standard DTE rates up to 115,200 bps
  - Asynchronous and synchronous operation
  - Physical interface is a SCSI-II 50-pin connector converted by a supplied cable to four EIA/TIA-232, 25-pin female connectors
- Error correction (ITU-T V.42 and MNP 2-4 error control)
- Data compression (ITU-T V.42 and MNP 2-4 data compression)

- Modulation:
  - ITU-T V.34 and V.FC at 28,800 bps
  - V.32terbo at 19,200 bps
  - ITU-T V.32*bis* at 14,400; 12,000; 9600, 7200, and 4800 bps
  - ITU-T V.32 at 9600 and 4800 bps
  - ITU-T V.22*bis* at 2400 bps
  - ITU-T V.22 at 1200 bps
  - ITU-T V.32 at 1200/75 bps
  - ITU-T V.21 at 300 bps
  - Bell 208B at 4800 bps
  - Bell 212A at 1200 bps
  - Bell 103 at 300 bps
  - QuickConnect technology
  - ASL

Cisco AS5100 Access Server Network Management Products

The Cisco AS5100 access server uses two network management products:

- Total Control Manager/SNMP (AS51-NMSW-1)

  Total Control Manger/SNMP is a Windows-based SNMP host software package that runs on any IBM-compatible 486 PC. This package communicates with the management card in each Cisco AS5100 access server chassis to perform all network management functions for the modem and T1 cards.

- CiscoWorks Windows (CWPC-x.x-OV or UPG-CWPC-x.x)

  CiscoWorks Windows includes the Configuration Builder application. The Configuration Builder application allows you to create configuration files for your access server without requiring you to remember complicated command-line language or syntax. For more information, refer to “CiscoWorks Windows” in the chapter “Internetwork Management” earlier in the catalog.

Cisco AS5100 Access Server Product Numbers

This section contains tables that list Cisco AS5100 access server product numbers. For document product numbers, see the chapter “Documentation” later in this catalog.

Table 182 Cisco AS5100 Access Server Systems

Description	Product Number
Complete chassis, AC, Ethernet network management card, and console cable	AS5101-A
Complete chassis, DC, Ethernet network management card, and console cable	AS5101-D

Table 183 Cisco AS5100 Access Server System Spares or Options

Description	Product Number
AS5100 16-slot AC chassis	AS51-CHAS-A=
AS5100 16-slot DC chassis	AS51-CHAS-D=
AS5100 AC-45A power supply	AS51-PWR-A=
AS5100 DC-45A power supply	AS51-PWR-D=
AS5100 AC fan tray[1]	AS51-FAN-A=
AS5100 DC fan tray[1]	AS51-FAN-D=
Cables	See Table 189

1. You should purchase a fan tray with any fully populated unit.

Table 184 Cisco AS5100 Access Server Interface Card Sets

Description	Product Number
AS5100 Ethernet network management card set	AS51-NMCS-E=
AS5100 dual T1 card set	AS51-2T
Quad V.34 digital modem set	AS51-4V34D
Quad V.34 analog modem set	AS51-4V34A
Quad V.34 analog/digital modem set	AS51-4V34AD
Access Server card set - 16A, 1E, 1T[1]	AS51-16A-E

1. Includes two CAB-AS51-8 (spare 8A cable from the Access Server AS5100 card set to two quad modem card sets).

Cisco AS5100 Access Server Bundled Systems

Although the Cisco AS5100 access server is a modular chassis that can be customized for your particular networking needs, it is also available in five different bundled systems (fixed hardware configurations) for North America only.

Table 185 describes the Cisco AS5100 access server bundled systems. Enterprise software can be ordered for bundled systems ending in "EN," and Remote Access Server software can be ordered for bundled systems ending in "RAS."

Table 185 Cisco AS5100 Access Server Bundled Systems

Description	Included Items	Bundled System Product Number
48-port digital V.34 modem system with AC power supply and Cisco IOS Enterprise software feature set	1 17-slot AC chassis (AS51-CHAS-A=) 2 45A power supplies (AS51-PWR-A=) 1 fan tray (AS51-FAN-A=) 1 Ethernet network management card set (AS51-NMCS-E=) 1 console cable (ACS-2500ASYN) 1 U.S. power cord (AS-KIT-US) 1 dual T1 card set (AS51-2T) 12 quad V.34 digital modem card sets (AS51-4V34D) 3 access server card sets (AS51-16A-E), which include 6-MB DRAM (2 MB soldered and 4 MB on SIMM) and 8-MB Flash memory on each access server card set 3 CiscoRemote Plus software user licenses	AS51AC-48V34D-EN
48-port digital V.34 modem system with DC power supply and Cisco IOS Enterprise software feature set	1 17-slot DC chassis (AS51-CHAS-D=) 2 45A power supplies (AS51-PWR-D=) 1 fan tray (AS51-FAN-A=) 1 Ethernet network management card set (AS51-NMCS-E=) 1 console cable (ACS-2500ASYN) 1 U.S. power cord (AS-KIT-US) 1 dual T1 card set (AS51-2T) 12 quad V.34 digital modem card sets (AS51-4V34D) 3 access server card sets (AS51-16A-E), which include 6-MB DRAM (2 MB soldered and 4 MB on SIMM) and 8-MB Flash memory on each access server card set 3 CiscoRemote Plus software user licenses	AS51DC-48V34D-EN
48-port digital V.34 modem system with AC power supply and Cisco IOS Remote Access Server software feature set	1 17-slot AC chassis (AS51-CHAS-A=) 2 45A power supplies (AS51-PWR-A=) 1 fan tray (AS51-FAN-A=) 1 Ethernet network management card set (AS51-NMCS-E=) 1 console cable (ACS-2500ASYN) 1 U.S. power cord (AS-KIT-US) 1 dual T1 card set (AS51-2T) 12 quad V.34 digital modem card sets (AS51-4V34D) 3 access server card sets (AS51-16A-E), which include 6-MB DRAM (2 MB soldered and 4-MB on SIMM) and 4-MB Flash memory on each access server card set 3 CiscoRemote Plus software user licenses	AS51AC-48V34D-RAS

Description	Included Items	Bundled System Product Number
16-port digital V.34 modem system with AC power supply and Cisco IOS Enterprise software feature set	1 17-slot AC chassis (AS51-CHAS-A=) 2 45A power supplies (AS51-PWR-A=) 1 fan tray (AS51-FAN-A=) 1 Ethernet network management card set (AS51-NMCS-E=) 1 console cable (ACS-2500ASYN) 1 U.S. power cord (AS-KIT-US) 1 dual T1 card set (AS51-2T) 4 quad V.34 digital modem card sets (AS51-4V34D) 1 access server card set (AS51-16A-E), which includes 6-MB DRAM (2 MB soldered and 4 MB on SIMM) and 8-MB Flash memory 1 CiscoRemote Plus software user license	AS51AC-16V34D-EN
16-port digital V.34 modem system with AC power supply and Cisco IOS Remote Access Server software feature set	1 17-slot AC chassis (AS51-CHAS-A=) 2 45A power supplies (AS51-PWR-A=) 1 fan tray (AS51-FAN-A=) 1 Ethernet network management card set (AS51-NMCS-E=) 1 console cable (ACS-2500ASYNC) 1 U.S. power cord (AS-KIT-US) 1 dual T1 card set (AS51-2T) 4 quad V.34 digital modem card sets (AS51-4V34D) 1 access server card set (AS51-16A-E), which includes 6-MB DRAM (2 MB soldered and 4 MB on SIMM) and 4-MB Flash memory 1 CiscoRemote Plus software user license	AS51AC-16V34D-RAS

Cisco AS5200 Universal Access Server

The Cisco AS5200 universal access server is a versatile data communications platform that provides the functions of an access server, a router, and digital modems in a single modular chassis. The Cisco AS5200 is intended for Internet Service Providers (ISPs), telecommunications carriers, and other providers that offer managed Internet connections, as well as small- to medium-sized sites that provide both digital and analog access to users on an enterprise network. By terminating both analog and digital calls on the same chassis simultaneously, the Cisco AS5200 provides you with a clear, simple, and easy migration path from today's predominantly analog dial-in services to tomorrow's digital dial-in services.

Note Customers with homogenous or segregated dial-up requirements might choose to implement central-site solutions with other Cisco Systems products such as the Cisco AS5100 access server for asynchronous modem dial in, or the Cisco 4000 or Cisco 7000 series for ISDN dial in.

Figure 86 Cisco AS5200 Access Server Front Panel

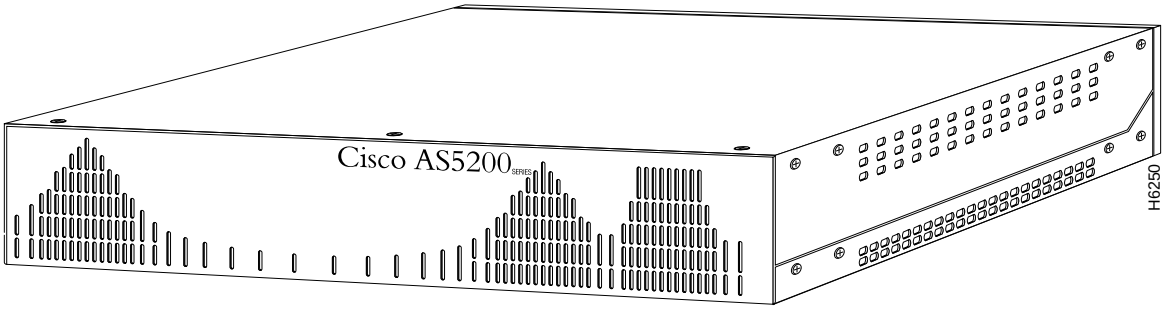
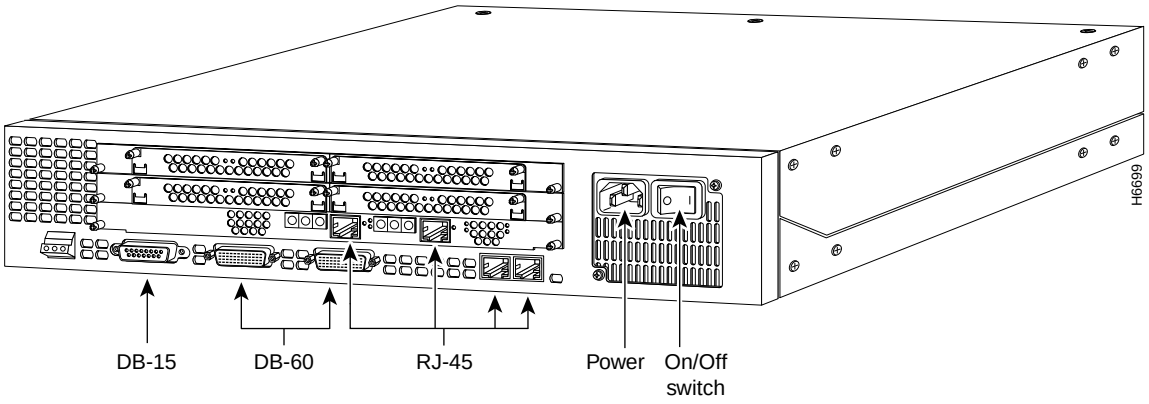


Figure 87 Cisco AS5200 Access Server Rear Panel



Cisco AS5200 Access Server Summary of Benefits

The unique combination of Cisco IOS software and the Cisco AS5200 access server mixed-media platform results in a host of benefits for network managers.

Universal Access

The Cisco AS5200 universal access server is the first product in an entire line of universal access solutions offered by Cisco Systems. Universal access is more than just providing connections from ISDN or asynchronous modems, but it is also the ability to do the following:

- Host remote node sessions in all of today's popular protocols (such as IP, IPX, and AppleTalk)
- Support legacy terminal services
- Route packets over synchronous and asynchronous media

The Cisco AS5200 access server provides universal access for small- to medium-sized dial-in sites. This access enables you to save money by using one trunk line, instead of two, for all calls, which reduces the number of system components and operational costs. The Cisco AS5200 access server also supports the widest array of networking and routing

protocols available in the industry. Not only does the Cisco AS5200 access server support remote node and remote LAN dial-in protocols, but it also supports all of the Cisco IOS-supported routing protocols.

Scalability

The scalability and manageability of a network are a concern for all network managers. With Cisco IOS Software Release 11.2, the Cisco AS5200 access server will support call aggregation among multiple chassis. Using multichassis, Multilink PPP, Cisco Systems has developed the means to aggregate multiple calls terminated on multiple servers. Network managers will have the ability to stack multiple AS5200 access servers for high-density applications.

Another important feature of scalability is managing the components of a growing network. The Cisco AS5200 access server supports both the command line interface and the CiscoWorks graphical user interface (GUI). Network managers can collect statistics from the modems, upgrade your modem software, group modems for configuration, soft- or hard-busy-out modems, and even monitor call-in-progress signals from individual modems, all from the same platform they already use to manage their routers.

Security

Cisco IOS software provides tight security in the core network, and with the Cisco AS5200 access server, extends that core security to mixed-media dial-in sites. Some of the features supported by the Cisco IOS are access lists, violation logging, Terminal Access Controller Access Control System (TACACS+), and RADIUS.

WAN Optimization

Cisco offers a wide array of WAN optimization features, including compression, routing filters, snapshot, bandwidth-on-demand, and dial-on-demand routing. These features help control WAN costs—the largest single cost of operating an internetwork.

Single Vendor Support

With the Cisco AS5200 access server, the router, access server, integrated CSUs, and modems are all supported by Cisco's world class 7-days-a-week, 24-hours-a-day global support team.

Compatibility

With the CSU, modems, routers and access server components integrated in one chassis, the Cisco AS5200 access server has been designed to avoid incompatibility concerns that plague multibox, multivendor installations, and for seamless interoperability among its integrated components. Fewer individual pieces of equipment reduce configuration and incompatibility issues.

Future

The modular design of the Cisco AS5200 access server chassis allows rapid implementation of new technologies as they become available (compression, encryption, 33.6-kbps modems, higher densities, and so forth).

Cisco AS5200 Access Server Series Product Numbers

Table 186 lists the product numbers for the Cisco AS5200 access server.

Table 186 Cisco AS5200 Access Server Product Numbers

Description	Product Number
Ethernet AS5200 chassis with AC power supply	AS5201
Ethernet AS5200 chassis with DC power supply	AS5201-DC
Ethernet AS5210 bundled system includes an Ethernet (AS5201) chassis with AC power supply, 48 Reliable modems, a dual T1 card, and IP only software	AS5210
Ethernet AS5210 bundled system includes an Ethernet (AS5201) chassis with DC power supply, 48 Reliable modems, a dual T1 card, and IP only software	AS5210-DC
Dual T1/PRI card	AS52-2CT1
Carrier card	AS52-MC1
Carrier card with two Microcom Select modules	AS52-24B-MCOM-V34/R
Carrier card with two Microcom Reliable modules	AS52-24B-MCOM-V34
Microcom Reliable V.34 12-port module	AS52-12-MCOM-V34
Microcom Select V.34 12-port module	AS52-12-MCOM-V34/R

Hardware Options

The Cisco access server series supports the hardware options listed in the following tables. If a product number ends with an equal sign (=), the item can be ordered only as a spare. If a product number does not end with an equal sign, the item can be ordered as a spare or as a configurable part of a system order.

Note For options that apply to most systems, refer to “Cables and Transceivers” or “Power Cords” in Part 7.

Table 187 Cisco Access Server Series Hardware Options—Cisco 2500 Series and Cisco AS5100

Option	Cisco 2500 Series Access Servers	Cisco AS5100 Access Server
19" rack-mount kit	ACS-2500RM-19=	–
24" rack-mount kit	ACS-2500RM-24=	–
Boot ROM upgrade	BOOT-2509/12=	–
4-MB DRAM	MEM-1X4D	–
4-MB DRAM (spare)	MEM-1X4D=	MEM-1X4D=
8-MB DRAM	MEM-1X8D	–
8-MB DRAM (spare)	MEM-1X8D=	–
16-MB DRAM	MEM-1X16D	MEM-1X16D
16-MB DRAM (spare)	MEM-1X16D=	MEM-1X16D=
4-MB Flash SIMM	MEM-1X4F	–
4-MB Flash SIMM (spare)	MEM-1X4F=	MEM-1X4F=
4- to 8-MB Flash SIMM upgrade	MEM-1X8F-U[1]	MEM-1X8F-DFB-U[1, 2]
8-MB Flash SIMM	MEM-1X8F	MEM-1X8F
8-MB Flash SIMM (spare)	MEM-1X8F=	MEM-1X8F-DFB=[2]
8-MB Flash SIMM	MEM-1X8F-U	–
Dual-sided 16-MB Flash SIMM	–	MEM-1X16F-DFB[3]
Dual-sided 16-MB Flash SIMM (spare)	–	MEM-1X16F-DFB=[3]

1. Applies to Cisco IOS Release 11.x feature sets that require 8-MB Flash memory.
2. Dual-bank Flash memory is required for AS5100 access servers because these models contain only one slot for Flash memory. It can operate as either two banks of 4 MB for dual-Flash bank operation or as 8 MB contiguous.
3. Dual-bank Flash memory is required for AS5100 access servers because these models contain only one slot for Flash memory. It can operate as either two banks of 8 MB for dual-Flash bank operation or as 16 MB contiguous.

Table 188 Cisco AS5200 Access Server Hardware Options

Option	Product Number
Memory Upgrades	
4-MB shared DRAM upgrade (for total of 8 MB)	MEM-8S-52=
12-MB shared DRAM upgrade (for total of 16 MB)	MEM-16S-52=
4-MB main DRAM upgrade (for total of 8 MB)	MEM-8M-52=
12-MB main DRAM upgrade (for total of 16 MB)	MEM-16M-52=
4-MB boot Flash upgrade (for total of 8 MB)	MEM-8BF-52=
Spares	
Dual T1/PRI card	AS52-2CT1=
Carrier card with two Microcom Select modules	AS52-24B-MCOM-V-34/R=
Carrier card with two Microcom Reliable modules	AS52-24B-MCOM-V-34=

Option	Product Number
Carrier card	AS52-MC1=
Microcom Select V.34 12-port module	AS52-12-MCOM-V34/R=
Microcom Reliable V.34 12-port module	AS52-12-MCOM-V34=
AS5200 modem blank panel	AS52M-BLANK=
AS5200 blank panel	AS52-BLANK=
Options for the AS5210 Bundled System	
Upgrade AS5210 modems to Microcom Select module	AS5210-MCOM-SEL-UPGD

Table 189 Cisco Access Server Cables

Cables[1]	Product Number
Synchronous serial[2]	
EIA/TIA-232 male DTE interface, 10' (3 m)	CAB-232MT
EIA/TIA-232 female DCE interface, 10' (3 m)	CAB-232FC
EIA/TIA-449 male DTE interface, 10' (3 m)	CAB-449MT
EIA/TIA-449 female DCE interface, 10' (3 m)	CAB-449FC
EIA-530 male DTE interface, 10' (3 m)	CAB-530MT
V.35 male DTE interface, 10' (3 m)	CAB-V35MT
V.35 female DCE interface, 10' (3 m)	CAB-V35FC
X.21 male DTE interface, 10' (3 m)	CAB-X21MT
X.21 female DCE interface, 10' (3 m)	CAB-X21FC
Auxiliary/console port cable kit[2]	ACS-2500ASYN
Asynchronous serial	
8-lead octal cable and 8 male DB-25 modem connectors	CAB-OCTAL-KIT
8-lead octal cable (68-pin to 8 male RJ-45 connectors)	CAB-OCTAL-ASYNC
8-lead octal cable and 8 female DB-25 terminal connectors	CAB-OCTAL-FDTE
8-lead octal cable and 8 male DB-25 modem connectors	CAB-OCTAL-MODEM
Male DB-25 modem connector	CAB-25AS-MMOD
Female DB-25 terminal connector	CAB-25AS-FDTE
8 female RJ-45 to female RJ-45 adapters	CAB-ADPTRS-RJ45
Cisco AS5100-specific cables	
8A cable from card set to two quad modem cards[3]	CAB-AS51-8=

1. For cable illustrations, refer to the section “Specifications” in the chapter “Cables and Transceivers” later in this catalog.
2. These cables can also be used with the Cisco AS5200 access server.
3. Two cables are included with each card.